

UNIVERSITY OF CALIFORNIA
COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATION
BERKELEY, CALIFORNIA

CIRCULAR 327

December, 1932

THE JUDGING OF DAIRY PRODUCTS

C. A. PHILLIPS¹ AND F. H. ABBOTT²

The teaching of dairy-products judging in universities and colleges has been brought about largely by the sale and purchase of certain dairy products on the basis of score. The scoring of products in contests at shows and fairs has also been influential. Butter is commonly bought and sold on the principal markets of the world either by score or by grade, and cheese is often marketed likewise. Milk and ice cream are not yet marketed according to score, although different grades³ of milk are sold for different prices, as are ice creams of commercial grades.

This circular, being intended to meet the educational needs of student instruction, includes enough information regarding causes to aid the student in identifying defects.

VALUE OF JUDGING

Judging enables the student of dairying to recognize defects and their causes, to appreciate the value of a superior product, and to know the conditions necessary for quality. Thus it trains students to be of greater service to the industry in the production of milk and in the manufacture of products. The result is greater uniformity, which at present is an important consideration in the dairy industry because it stimulates an increase in per-capita consumption.

After college training in judging, a proficient student can enter the commercial grading field, where butter and cheese are placed in the several grades recognized by the market. In this grading work, the total score on the product is the principal item. It is secured by summing up

¹ Associate in Dairy Industry.

² Associate in Dairy Industry.

³ Agricultural Statutes of the State of California, Part 10, Dairy Laws.

the whole situation without considering the detailed items on the score card. Judging experience with score cards is necessary before grading can be done efficiently.

The market-milk inspection field also offers opportunity to judging students, because scoring is an important part of milk-control work.

CONTESTS

Collegiate contests in judging market milk, butter, and cheddar cheese have been held in this country for the past fifteen years. High-school competitions of the same nature have been conducted regularly in California since 1924. Vanilla ice cream has recently been included in the collegiate scoring contests.

Entering a Contest.—A student entering a contest should be in good health and in good physical condition. A normal night's sleep previous to the contest is desirable. A bath and a complete change of clothing are important, because odors from the body or clothes affect the efficiency of the individual.

Coaches disagree regarding the proper diet previous to the contest. Although some recommend a very light meal, a normal meal of staple foods is probably more desirable. A contest is usually of 3 or 4 hours' duration; and a tired, hungry student may work less efficiently and detect off-flavors less easily.

Strong foods, such as onions, garlic, fish, or dishes highly spiced or flavored, should not be eaten just before a contest. Smoking at such a time probably results in inefficiency.

Standardization of Scoring.—Judges in the several parts of the country vary considerably in scoring—more often in the case of cheese and ice cream, however, than with milk and butter.

Market-milk judging has been standardized throughout the country by representatives of the United States Department of Agriculture Bureau of Dairy Industry, who have cooperated with state, county, and city officials. Their procedure, first published in 1919, was revised in 1925, and again in 1929.⁴

Butter scoring and grading are now well standardized because educational and commercial judges have followed similar ideas and methods for a considerable length of time.

Cheddar-cheese scoring lacks standardization because the score cards vary in different sections of the country. Judges do not agree on the range of scores on flavor, body, and texture for this product.

⁴ Babcock, C. J., and C. S. Leete. How to conduct milk and cream contests. U. S. Dept. Agr. Cir. 384:1-22. 1929.

Although the scoring of vanilla ice cream is comparatively new in student judging, rapid strides are being made toward its standardization.

Dairy-products-judging committees of the American Dairy Science Association are taking the lead in the standardization of scoring with resultant improvement. In student judging contests throughout the country, the scores on the cards used are uniform, although the criticisms vary considerably.

Organization of Contests.—Collegiate judging contests are usually sponsored by the American Dairy Science Association, cooperating with show and industry organizations.

A public official who is familiar with judging is usually selected as superintendent to organize and promote the contest, and to supervise the calculation of results. He selects two or three qualified judges to place the official scores on each product.

Prizes, consisting of cups, plaques, medals, ribbons, and sometimes merchandise, are awarded to team and individual winners in the various products.

Selection and Preparation of Samples.—Seven samples of each product are usually selected for a contest. No two samples in the lot should resemble each other too closely, and the quality should vary from excellent to poor. The flavor scores should extend over at least the upper three-fourths of the normal range of score for each product, as follows: butter, 33 to 40; cheese, 34 to 41; milk, 15 to 24; and ice cream, 37 to 45. Occasional samples with the lowest score in the normal range may be included, but are somewhat difficult to obtain in show contests. Products scoring below the normal range in flavor—that is, butter and cheese, below 30, milk below 12, and ice cream below 35—should not be included.

Two key samples, one good and the other poor, or three key samples, one each of good, medium, and poor quality, are scored by the official judges and submitted with the scores to the students. One or more of these samples should show defects that will appear in the class to be scored. This consideration is more important in the case of beginners than for those who have had considerable training. The key samples give the students a fairly good idea of the judges' opinions of defects. A sample identical with one of the key samples is sometimes placed in a contest, and accurately tests the ability of the student judges.

In milk judging, quart samples are necessary for every 15 students. Five raw milk and two pasteurized samples make a desirable class. A temperature range of 90° to 100° F is designated for scoring flavor and odor. The higher temperature is desirable because defects may be more readily detected at 100° F than at 90° to 95° F.

To obtain the foreign material in one pint of milk for sediment judging (fig. 1), sediment testers are used. The milk is forced or drawn through a cotton filter which collects the sediment. Several makes of these testers are offered by the leading dairy equipment and supply houses. Milk other than that furnished for flavor scoring should be used in preparing the sediment disks, since sediment may have to be added in order to prepare disks with a suitable range of scores.

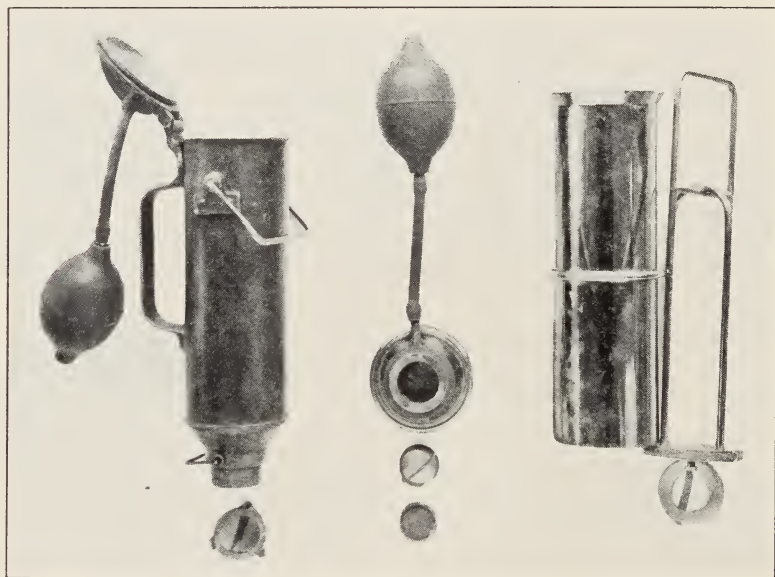


Fig. 1.—Some of the types of sediment testers used to collect sediment on a cotton filter.

A third set of milk samples is necessary for the judging of bottle and cap. These may be selected from the show or fair samples, or may be prepared by the superintendent or his assistants. In case of leaky bottle and cap, care should be taken to keep the defect uniform throughout the contest.

When the student judge scores the milk, he should remember that frequently different sets of samples are used for flavor and odor, for sediment, and for bottle and cap.

Butter samples of 10 to 20 pounds each should be obtained in butter boxes or tubs. Flat boxes, 10 by 10 inches, and 5 inches deep, are very desirable, since they afford large surfaces for sampling. In case of tall tubs or boxes, the butter may have to be inverted towards the end of the contest, if it becomes badly plugged. Butter samples should be sectioned off in case the students must be divided into two, three, or four groups,

each group sampling from one section. They should be tempered at 50° F before scoring, and the temperature of the judging room should not exceed 50° F, in order that the butter may not become too soft for accurate judging.

Cheddar-cheese flats weighing from 20 to 30 pounds are usually selected for cheese judging. Temperatures for scoring are less important than for butter but should range between 50° and 70° F.

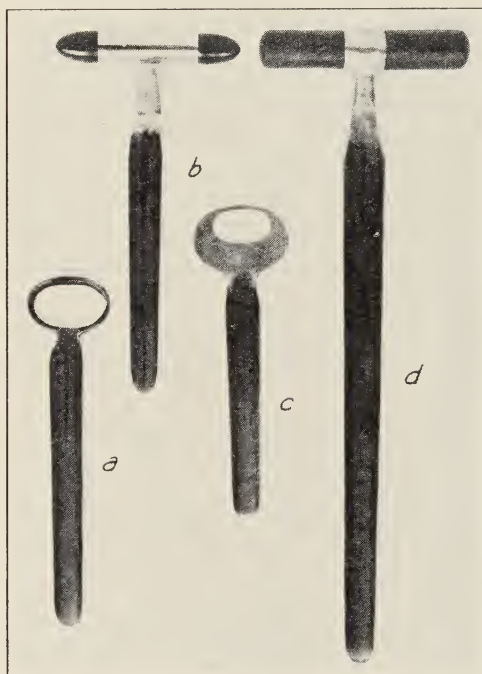


Fig. 2.—Types of triers: *a* and *b* are cheese triers; *c* and *d* are for butter sampling.

Bulk samples of vanilla ice cream of 2 or more gallons are desirable because smaller packages usually lack uniformity. They should all be tempered at 0° to 10° F and handled alike before scoring. They should not be allowed to become soft before being dipped and submitted to the students.

Equipment for Judging.—Score cards for each product are furnished by the superintendent. Each student should have one or more pencils with lead of medium consistency, in order to facilitate ease of erasing if necessary. Fountain pens should not be used.

Triers for butter and cheese judging are necessary and are furnished by the student; those of forged steel are more desirable than the ordi-

nary flat-handled sort, but are more expensive. Some judging teams use different triers for butter and for cheese judging—a wide trier for a round plug of butter, and a narrow one for a tapering plug of cheese—because no trier works very satisfactorily with both products. Triers (fig. 2) may be purchased from the leading dairy supply and equipment companies. Tissue paper for cleaning triers and waste containers for used paper are necessary.

Small milk bottles, beakers, or paper cups are used for sampling milk, paper dishes and metal or wooden spoons in scoring ice cream.

Procedure in Judging.—Judging teams consist of three students. A fourth student usually accompanies the group and is held in reserve as an alternate. At the beginning of the contests the team coach may substitute him for one of the regular team.

The superintendent or his representative arranges the students in order, gives each a number, and writes down the names and other required data. In case of large contests, the students should be divided into three or four groups.

The key samples are placed before the students 15 minutes before and sometimes throughout the contest. These samples and their scores should be examined carefully.

Students should thoroughly know the rules, which vary for different contests throughout the country and are subject to change annually. The rules for the 1932 collegiate judging contest sponsored by the Western Division of the American Dairy Science Association appear in the Appendix (p. 37).

Students should plan to finish scoring the samples within the time specified. The score cards should be numbered to correspond with the numbers on the samples. Scores should be so written that they are easily readable, and the check marks should be directly opposite the criticism intended. Decimal points in the scores should be placed in a vertical row, one beneath the other, to aid in obtaining the correct addition in the total score.

Tie scores in the total should be broken by adding or deducting from the flavor score of one of the samples, usually 0.1 point for milk and 0.25 point for the other products.

MILK JUDGING

Three items only are considered in student milk-judging contests: flavor and odor, 25 points; sediment, 10 points; and bottle and cap, 5 points, giving a total of 40. The remaining 60 points on the milk score card adopted in 1929 by the American Dairy Science Association are:

bacteria, 45 points, and temperature or acidity, 15. Bacteria and temperature or acidity are not considered in student judging.

In California, the earlier score card is used in show, fair, and city milk-scoring contests. The subdivisions are: bacteria, 35 points; flavor, 15 points; sediment, 10 points; fat, 15 points; solids-not-fat, 15 points; temperature or acidity, 5 points; and bottle and cap, 5 points.

Scoring for Flavor.—In experimental work, a combination of taste and odor is said to constitute flavor, but in student judging the flavor of milk is considered to be the taste alone, which is described⁵ as the sensation perceived when milk is taken into the mouth. Odor or aroma is the sensation observed when the milk is subjected to examination by the nasal passages alone.

The average student usually knows when there is something wrong with the flavor or odor of milk, but often he is unable to place the proper score on the sample or to name the correct defect. Proper instruction and experience in practice should, however, familiarize him with the procedure, so that he will be able to make the decisions quickly. A form of milk score card with the criticisms listed is given below. A description of the common defects and a discussion of their causes should aid in their identification.

MILK SCORE CARD *

Contestant No.....Sample No.....

	Student	Official	Grade		Criticisms
			Score	Criticism	
Flavor (25).....					FLAVOR
Sediment (10).....					Barny Flat Rancid Bitter Foreign Salty
Bottle and cap (5).....					Cooked High acid Tallowy Feed Musty Unclean
Total (40).....					
Placing.....					SEDIMENT
					Score cottons as per photograph in U. S. Department of Agriculture, Circular 384.
Grade on criticism.....					BOTTLE AND CAP
Total grade.....					Chipped mouth Lip not protected Not full Dirty bottle Lip partially Thumb Leaky cap protected capped

* Recommended by the Western Division of the American Dairy Science Association, for student judging contests.

⁵ Roadhouse, C. L., and G. A. Koestler. Contribution to the knowledge of the taste of milk. Jour. Dairy Sci. 12:421-437. 1929.

Barny flavors or odors are absorbed from odors produced by insanitary conditions in the barn. The criticism “cowy”⁶ is sometimes used instead of barny, and appears on some score cards. Many authorities, however, consider “cowy” an inexact criticism which should not be used. A barny flavor or odor in milk is often confused with feed. If in doubt, the student will probably do better to check feed.

Bitter flavor may result from different causes, the most common probably being bacterial action and the eating of certain feeds by the cows. A slight bitterness may not always be detected immediately, but the judge should be able to get the defect as an aftertaste. If the judge concludes that bitterness results from feed, this criticism should be checked instead of bitter, or in addition to it.

Cooked flavor or odor results from excessive temperatures of pasteurization or improper methods used in heating the milk. Pasteurization in California consists of heating the milk to a temperature between 140° and 145° F, holding it between those temperatures for 30 minutes, and then cooling it to 50° F. Most pasteurizing plants use a temperature of 142° F to guard against the cooked flavor and odor and the injured cream layer which are often obtained at 145° F.

Feed flavors and odors are very common, especially when the cows eat green feed previous to milking. Alfalfa, clover, grass, and many other feeds will give distinct flavors and odors to milk if fed during the 5-hour period before milking. Weeds such as wild onion, garlic, mustard, alfilaria, and stinkweed, cause strong flavors. Investigation by the United States Department of Agriculture, Bureau of Dairy Industry,⁷ has shown that garlic flavor and odor may be present in milk when the cow breathes the odor from garlic tops without consuming any of them. When the tops are not available, this result may be duplicated by using bulbs. Garlic-flavored milk has been placed in the judging contests at the National Dairy Show at St. Louis for the past few years. The milk may also absorb feed odors if it is exposed to them.

Flat flavor, somewhat resembling that of skim milk, occurs when milk is low in milk fat or milk sugar. Milk which is poor in total solids is often lacking in body, a condition contributing to a flat flavor. Milk diluted with a small amount of water may also be considered flat if the criticism “watered” does not appear on the score card. Flatness cannot be detected in the odor.

⁶ Babcock, C. J., and C. S. Leete. How to conduct milk and cream contests. U. S. Dept. Agr. Cir. 384:1-22. 1929.

⁷ Babcock, C. J. Effect of garlic on the flavor and odor of milk. U. S. Dept. Agr. Dept. Bul. 1326:1-10. 1925.

Foreign flavors may be numerous, although this criticism is not often used. Cresol or chlorine disinfectants used in the dairy or milk house may cause the defect, although the criticism "disinfectant" is used on some score cards. Milk handled in rooms in which fresh paint, tobacco smoke, gasoline, or oil are present, may absorb a foreign flavor or odor.

High-acid milk is usually in the first stages of sourness, lactic-acid-forming bacteria having changed some of the milk sugar to lactic acid. As the acidity develops, the casein is precipitated, a condition also known as coagulation or curdling, causing the milk to be unmarketable. A good judge should be able to recognize high-acid milk by the odor. Strong feed flavors and odors sometimes suggest a high-acid condition, and only tasting can determine which defect is present. A high-acid milk is usually scored 12 to 15 points on flavor, and a sour milk, zero. The latter is outside the normal range, and any such samples should be eliminated from student judging contests.

Musty flavor may be caused by the cow's eating musty or moldy feed, or by bacterial or mold growth in the milk sample. It is more uncommon than the other flavor defects.

Rancid flavor results from chemical changes of the milk fat, probably with the formation of butyric acid. This defect frequently occurs in milk with high fat content when lipase, a fat-splitting enzyme, is present. Rancidity is usually not noticeable in freshly drawn milk, but develops as the milk is held. Cows with udder disturbances, heavy-producing cows advanced in the lactation period, and in some instances those having cystic ovaries may produce milk that becomes rancid a few hours after being drawn.⁸

Salty milk is uncommon, unless the sample is obtained from a cow in an advanced stage of lactation. It resembles normal milk with a small amount of table salt added. The usual procedure in student contests is to use normal samples of milk instead of preparing them by adding salt or other material.

Tallowy was substituted for "metallic" and "cardboard" in 1931 by the Rules Committee of the Western Division of the American Dairy Science Association. This defect in flavor, which has also been called "cappy," at the present time is called "oxidized" in experimental work and in show and city scoring contests in California. It occurs most often in pasteurized milk, although it is not uncommon in raw. Milk coming in contact with certain metals, such as copper and its alloys, dissolves some of the metal, which then stimulates oxidization of the milk fat.

⁸ Koestler, G., C. L. Roadhouse, and W. Lörtscher. Zur Kenntnis der Zekretion Lipolytisch Aktiver sogenannter "ranziger" Milch. Landw. Jahrb. Schweiz. [Agr. Year Book of Switzerland] 1928:937-966.

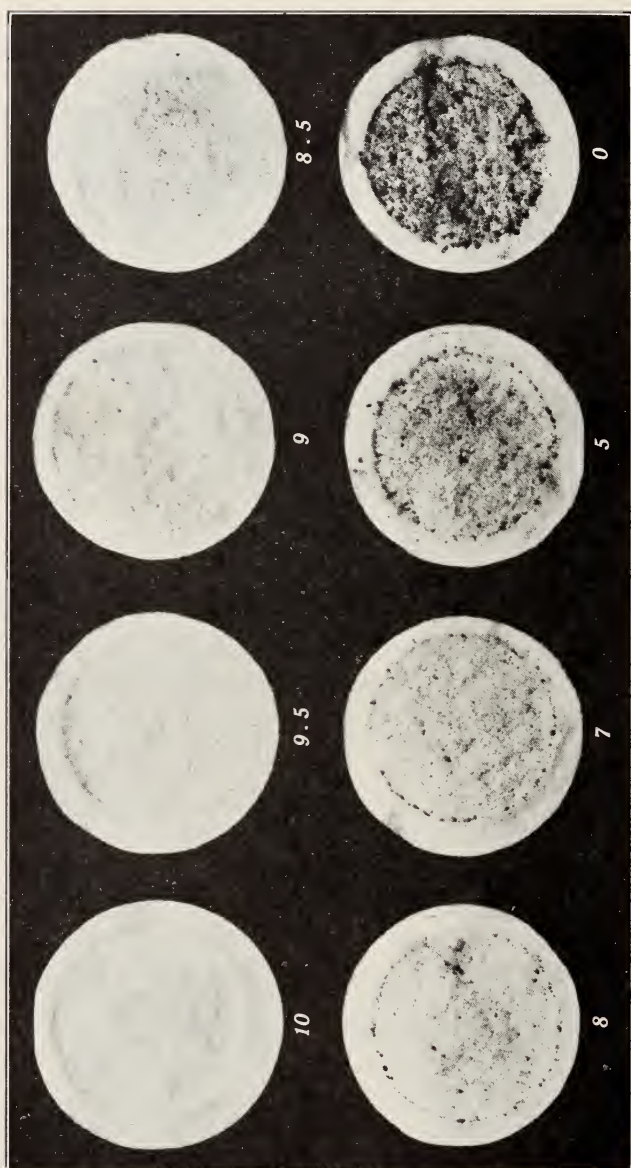


Fig. 3.—These disks, (actual size) may be used as a guide in scoring sediment.

Exposure of milk to light, especially direct sunlight, also causes oxidation and a tallowy flavor.

Unclean milk has an offensive flavor and odor, suggesting that it has been produced under insanitary conditions. This defect should not be confused with the barny quality, where odors are absorbed. Bacterial contamination, caused by improperly cleaned and sterilized utensils, is probably the chief cause. Lack of proper cooling intensifies the defect.

Scoring for Sediment.—In city milk-scoring contests and at fairs and shows, sediment is scored by observing the bottom of one of the pint bottles exhibited. Bright daylight or an electric light is essential, but direct sunlight is too glaring and may strain the eyes of the judge. The bottle is usually inclined, but should not be tipped more than 45 degrees, as the clumps of sediment may be broken, making it difficult to place a proper score on the sample.

One-tenth point is deducted for each two specks or particles of sediment. As a judge cannot well count more than 10 to 20 particles, an estimation is made in case of larger amounts. The normal range of scores in this work is from 5 to 10 points, although very bad samples may be scored zero. Judges should not mistake air bubbles in the glass or a dirty bottle for sediment.

Sediment disks are used in student judging contests. Two key disks, preferably one each of high and low scores, are scored by the official judges and placed before the students, who then score the contest disks by comparing them with the key samples. The series of disks scoring from 0 to 10 shown in figure 3 may be used as a guide.⁹ Clean disks, showing no particles, are given a perfect score of 10 points. As the amount of sediment increases, the deductions should be made in 0.1 of a point down to 9.0; in 0.2 or 0.3 points from 9.0 to 7.5; in 0.5 points from 7.5 to 5.0; and in 1.0 point cuts from 5.0 to zero. Sediment disks are usually displayed in petri dishes for student scoring.

Scoring for Bottle and Cap.—A perfect score is given to bottle and cap when the lip is completely protected with the proper type of covering, securely fastened, provided no defect is present in the bottle itself. Thick paper coverings clamped with wire, metal caps, foil coverings, and cardboard crimped on by means of pressure and heat, are examples of caps which are scored 5 points (fig. 4). Suggested cuts for defects in bottle and cap are given in the Appendix.

Chipped mouth refers to any break or crevice in the seat or pouring lip of the bottle. Dirt may collect in such places, causing a contamina-

⁹ Babcock, C. J., and C. S. Leete. How to conduct milk and cream contests. U. S. Dept. Agr. Cir. 384:1-22. 1929.

tion of the milk during pouring. Protected or partially protected lips are not criticized as chipped, providing the protection covers the defect.

A bottle is criticized as *dirty* only when the dirt is on the inside (fig. 5). This defect may result from improper washing or from stain-producing materials placed in the bottle.

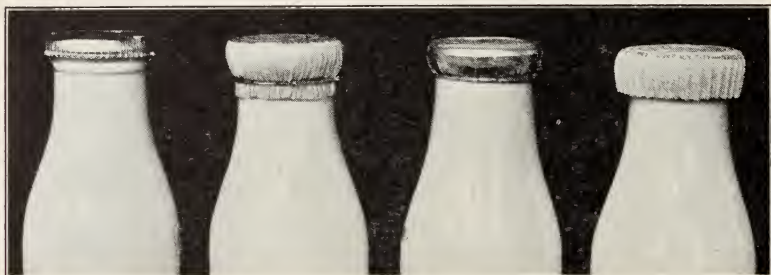


Fig. 4.—Four of the common types of bottle caps which afford proper protection to the pouring lip.

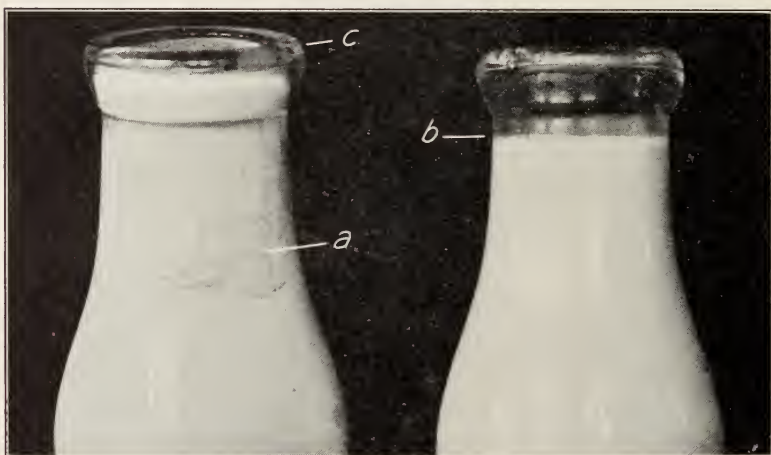


Fig. 5.—Defects in bottle and cap: *a*, dirty bottle; *b*, not full; *c*, lip not protected.

A *leaky cap* allows beads or drops of milk to seep out when the bottle is inverted for a short time. Such caps are poorly seated or loosely fastened, as usually in the case of thumb-capping (fig. 6). Milk is generally cold when bottled and capped. The increase in temperature during a contest produces an expansion which often forces out some milk. This condition should not be considered as a leaky cap, and no cut should be made. In student judging contests, the official in charge should keep such milk wiped off with a clean piece of cheese cloth.

Lip not protected is checked when the cap is of the "common sense" type, fitting down into the seat of the lip (fig. 5c). The deduction should be 1 point.

Partial protection is given by caps covering part of the lip, or by caps completely covering but of poorer quality (fig. 7). These caps are scored from 4.25 to 4.75 points, according to the protection given. Any caps which may be removed and replaced by hand without detection should be included in this classification.

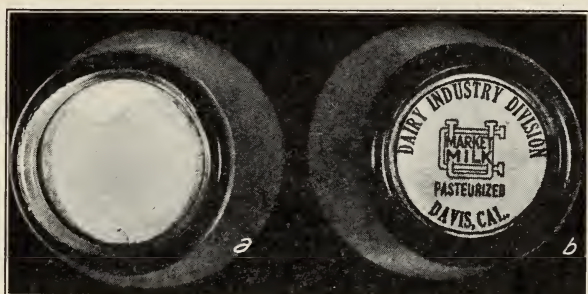


Fig. 6.—Leakiness is usually caused by thumb-capping: a, thumb-capped; b, machine-capped.

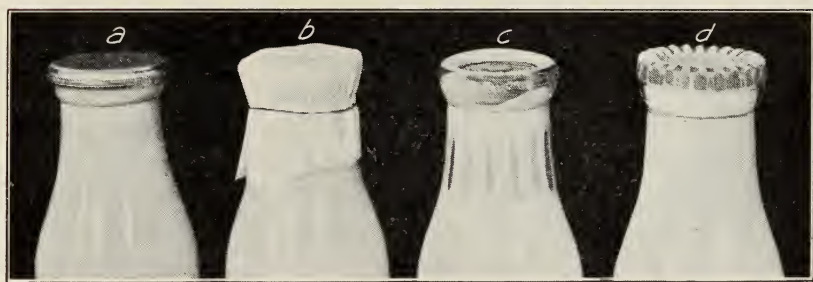


Fig. 7.—Types of caps giving partial protection to the pouring lip: a, metal covering not securely fastened; b, parchment covering; c and d, lip partially covered.

Bottles which are *not full* are uncommon in scoring contests but may easily be prepared for student judging. If they are not filled to the bottom of the cap seat, there is a deduction in score, which varies according to the opinions of judges in different parts of the country. The procedure followed in western college contests has been to deduct 0.25 point if the milk is $\frac{1}{8}$ inch below the intersection of the pouring lip and bottle proper, 0.5 point for $\frac{1}{4}$ inch, and 1 point for more than $\frac{1}{4}$ inch (fig. 5).

Thumb-capped refers to the cap's being placed on the bottle by hand instead of by a machine (fig. 6). Market-milk specialists in California are cutting 1 point for this defect in city work, although 0.5 point deduc-

tion is usually made in student judging. Thumb-capping of bottles is considered insanitary.

Absorbent cap protector and *loose cap cover* are defects listed under bottle and cap on the score card used in the National Vocational milk-judging contests. Students expecting to enter the contest at the National Dairy Show should obtain the judging pamphlet¹⁰ from the Federal Board for Vocational Education, Washington, D. C.

BUTTER JUDGING

The accompanying butter score card contains five subdivisions: flavor, 45 points; body and texture, 25 points; color, 15 points; salt, 10 points; and package, 5 points—a total of 100 points. Nearly half of the total number of points are allowed for flavor, which receives the most attention from consumers.

To obtain a plug of butter for scoring, the butter trier is inserted into the butter, turned slightly more than half way around, and pulled out. In student judging the plugs should be drawn vertically, since only a small space is available for a large number of triers of butter. Official judges in show contests, however, usually draw plugs diagonally from the tub or box.

When the plug of butter is obtained, the odor and the evenness of color are observed immediately. Defects in body and texture may be noted by pressing upon the butter with the thumb or a small hardwood paddle. The latter method is used in Denmark and by some judges in this country. It is a sanitary procedure and is to be recommended, especially if the butter being scored will be used for human consumption. A portion of the butter is taken into the mouth and melted, and its flavor observed. Care should be taken not to swallow the butter, for to do so would interfere with further scoring.

Flavor.—A sample of butter is seldom given more than 40 points on flavor by the judges. If the other items had perfect scores, and 40 points were allowed on flavor, a sample of butter would score 95 points. The average score on butter winning first place at fairs and dairy shows throughout the United States is 95 to 96 points. Such butter is usually made from selected fresh, sweet cream and represents the best workmanship. Butter is seldom scored 97 to 100 points, because of the custom of past years, and because most authorities believe that some provision should be made for improvement in the future. The subject is debatable, but a student should not score any sample of butter higher than 40 or 41 points for flavor.

¹⁰ Announcement of the Annual American Vocational Dairy and Poultry Convention, Federal Board for Vocational Education, Washington, D. C.

In leading butter markets where the grading of butter is under the supervision of the United States Department of Agriculture Bureau of Agricultural Economics, the top grade of market butter known as "Extra" usually receives a score of 92. Flavor, therefore, would be given 37 points, provided the other items on the card received a perfect score. The lower grades of butter on the markets usually receive scores of 88 and 89. The usual range in flavor score for commercial butter would therefore be 33 to 37 points.

The normal range of scores for flavor in student judging is given as 30 to 40 points (see Appendix), but in contests the range has usually been from 32 to 39.5 points. Samples receiving 38 points and above are not criticized, but with those scoring below 38 points, one or more defects are checked.

Objectionable flavors in butter often originate in the cream before it reaches the creamery. The best cream for buttermaking is sweet and free from undesirable odors or flavors. Cream that is produced where all the milk utensils are carefully cleaned and sterilized after each using, the cow's udders and flanks are cleaned before milking, and the cream is promptly cooled after separating and delivered to the creamery sweet, will produce butter of best flavor and keeping qualities. Cream that is sweet when it reaches the creamery will not always, however, make good butter. Even a few hours after it is produced, it may contain undesirable bacteria, some of which withstand pasteurizing temperatures and later injure the flavor of the butter. The flavor of butter may also be affected by improper methods used in the manufacturing plant.

Among the flavors common to butter, as given on the score card, such flavors as metallic, fishy, rancid, and tallowy are among the most undesirable; and butter containing them usually receives scores from 33 to 35 for flavor—seldom higher, and frequently lower.

Such flavors as bitter, old cream, storage, neutralizer, oily, unclean, and feed, usually have a wider range of scores than those given above. A sample of butter may be only slightly affected, or again, these flavors may be so objectionable that as low as 33 points will be given for flavor; the usual score in such cases is 33 to 37.5 points. Most of these flavors usually become more pronounced with the aging of the butter. They are almost impossible to describe, for the only satisfactory method of training students to detect flavors is to let them taste the product.

Bitter flavor is caused by the presence of impurities in the salt, the common ones being chlorides of potassium, calcium, and magnesium. Under certain conditions, bitter flavor may also be caused by feed or weed flavor in the cream, by yeasty cream, or by bacterial action in the cream before churning.

Briny flavor is the result of failure to incorporate and distribute the salt and water evenly throughout the butter. The average salt content of American butter is between 2 and 3 per cent. Butter containing as low as 1.5 per cent may, if the salt and water have not been thoroughly worked in, have a more pronounced briny flavor than properly worked butter containing 3 per cent salt.

BUTTER SCORE CARD*

Contestant No. Sample No.

	Student	Official	Grade		Criticisms		
			Score	Criticism			
Flavor (45).....					Bitter	FLAVOR Flat	Old cream
Body and texture (25).....					Briny	Foreign	Rancid
					Cheesy	High acid	Scorched
Color (15).....					Coarse	Metallic	Tallowy
					Feed	Neutralizer	Unclean
					Fishy	Oily	
Salt (10).....					BODY AND TEXTURE		
Package (5).....					Cloudy brine	Overworked	Sticky
					Leaky	Short-grained	Weak
Total (100).....					Mealy		
Placing.....					COLOR		
					Color specks	Mottled	White specks
Grade on criticism.....							
Total grade.....					SALT Gritty	PACKAGE Dirty tub	Untidy

* Recommended by the Western Division of the American Dairy Science Association, for student judging contests.

Cheesy flavor often appears in butter during the hot summer months when sour, curdy cream has been used. The excessive ripening of cream, the use of overripe, curdy starter, or the presence of excessive amounts of buttermilk in the butter, may also cause the defect. Under certain conditions, bacterial action may cause a putrid surface taint similar to the flavor and odor of limburger cheese.

Coarse flavor is a term used to describe fairly good butter having no specific off-flavor but lacking in delicate flavor and aroma. Good butter which contains excessive salt should be criticized as coarse, and is usually scored 37 or 37.5 points for flavor.

Feed flavors are commonly found in butter, ranging from a mild feed flavor to a decidedly undesirable one. Alfalfa, clover, turnips, and silage seem to affect the flavor more than do hay, concentrates, green corn, and blue-grass pasture. Garlic, wild onion, ragweed, and leek are especially objectionable.

Fishy flavor is readily detected after it has once been observed. The best way to describe a typical fishy flavor in butter is to compare it with salted mackerel, which it markedly resembles. It is caused by a chemical decomposition of lecithin,¹¹ one of the natural constituents of butter. The presence of salt, acid, and the metallic salts of copper and iron accelerates the decomposition. Fishy flavor is very undesirable and renders the product of little commercial value. Such butter is usually scored 31 to 34 points for flavor, according to the seriousness of the defect.

Flat flavor is a term used to indicate the lack of flavor. Such butter is low in volatile acidity, as are most clean-flavored cooking compounds. Excessive washing of sweet cream butter with cold water, and dilution of cream with water, cause this defect. Water has a tendency to absorb volatile butter flavors. Some judges use the criticism if the salt content is very low, or if the butter is made from sweet cream without the use of starter.

Foreign flavor is a term applied to butter that has a defect occurring from an exterior source, rather than from the cream or the process of manufacture. Kerosene, gasoline, smoky, or woody flavors may be included under this heading, and are usually absorbed during improper exposure of butter or during shipment of cream in cans that have contained kerosene or gasoline.

High-acid flavor and odor result from the churning of cream containing excessive amounts of lactic acid, caused either by natural development or by the improper use of starter. Butter churned from cream in which more than 0.25 per cent lactic acid has developed usually has an acid flavor and aroma. The defect may be counteracted by reducing the acidity in sour cream with alkalies, and by developing only small amounts of acidity when starter is used. High-acid butter can usually be detected by the aroma.

Metallic flavor in butter is astringent, usually because of the chemical reaction between the milk or cream and metals. Metallic flavors may have their origin during the care of the products on the farm, if milk or cream comes into contact with rusty cans; or they may originate in the creamery, where copper is often exposed. The flavor resulting from such metals is undesirable in fresh butter; it becomes stronger and exceedingly undesirable after holding. Such butter can never be stored satisfactorily for later use. This defect is not always sharply pronounced. It may accompany other flavors, such as old cream, or may border on fishiness, oiliness, or tallowiness.

¹¹ Hunziker, O. F. The butter industry. 682 p. Published by the author, La Grange, Illinois. 1927.

Neutralizer flavor is the reverse of high acid, since some alkali or combination of alkalies has been used to reduce the acidity in the cream before churning. This process, though known as neutralization, should be termed standardization of acidity, since complete neutralization is not practiced. Lime and soda are two of the most common neutralizing substances. A neutralizer flavor in butter depends largely upon the degree to which acidity is reduced. Cream may be neutralized from 0.30 per cent to 0.25 per cent acidity without developing the flavor to any objectionable extent, while a reduction from 0.60 per cent to 0.25 per cent would be very noticeable. Improper methods of neutralization within narrow limits may cause the defect. Because cream of medium or poor quality is usually neutralized, this flavor is often associated with the defect old cream.

Oily flavor is difficult to detect, since it is usually not well defined. Information regarding oiliness is not conclusive, but the flavor suggests that of machine oil. Kerosene and gasoline do not cause this condition; the criticism foreign covers these defects. The pasteurization of sour cream at high temperatures and the exposure of such cream to air and light are conducive to oiliness. Such butter does not keep well in storage, for metallic or fishy flavors are likely to develop.

Old cream, one of the most common defects found in butter, is caused by the churning of cream of poor quality. A buttermaker can usually determine by tasting the cream whether or not the butter will have an old-cream flavor. Holding cream for too long a time in the dairy, especially where there has been faulty sterilization of utensils and lack of cooling, is usually responsible for the difficulty. Old-cream butter may later develop fishy, rancid, bitter, tallowy, oily, or other off-flavors.

Rancidity is seldom found in freshly made butter, but is a well-known defect of old butter. Fat-splitting enzymes cause a hydrolysis of the milk fat, changing the glycerides of the fats into free fatty acids and glycerol. The formation of butyric acid is thought to be closely related to rancidity, the resultant odor being similar to rancid flavor and odor of butter. As bacteria, yeast, and mold organisms produce enzymes, proper pasteurization is essential in controlling rancidity. High-salt butter is less liable to be rancid than low-salt butter.

Scorched flavor, also known as "burnt" or "cooked" flavor, is caused by excessive heating of the cream during the pasteurization process. A slight trace of it, readily detected in fresh butter, usually disappears as the butter is held for a few days. Pronounced scorched flavors are more lasting and may develop into more serious defects.

Tallowy butter has an odor and flavor like that of tallow. It is usually bleached in color, and may turn entirely white if held for a long period

of time. The first stages of tallowiness may be mistaken for a scorched flavor; two samples of butter in important show contests during 1931 were criticized by the official judges as scorched, but later developed distinct tallowy flavors. Tallowiness is the result of an oxidation of the milk fat, which is accelerated by the exposure of cream and butter to air, heat, and light, as well as by the presence of metals or metallic salts, which act as catalyzing agents.

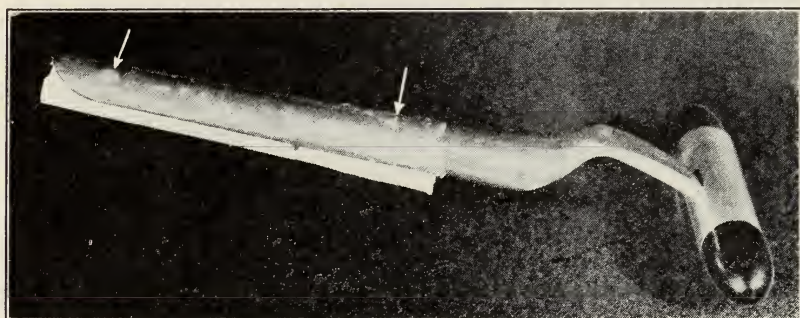


Fig. 8.—Arrows point to water droplets on back of butter trier. The apparent stickiness appearing on the trier is a thin film of butter magnified somewhat by the camera. This condition should not be confused with that shown in figure 10.

Unclean flavor may be caused by improper methods of production, such as exposing the cream to foul odors or placing it in unclean containers. It may also be caused by certain types of bacteria in the cream. This defect should not be used to designate old-cream flavor or any of the other distinct defects. It is a rather uncommon criticism in judging butter.

Body and Texture.—The body and texture of butter are included under one heading, the normal score ranging from 23 to 25 points. A perfect score is given unless a defect is present. Slight defects are usually cut 0.5 point; more pronounced defects, 1 to 2 points.

The body of butter is considered to be the firmness and this is affected largely by the composition and proportion of the different fats which compose butter. Texture is the internal character, or grain, which may be controlled to a large extent by methods of manufacture.

Cloudy brine is apparent when the buttermilk has not been properly washed from a leaky sample of butter. Both criticisms should be checked on such a sample, provided there is a large amount of free water showing. Cloudy brine can be easily detected by placing the trier in such a position that the water droplets can be seen against a dark background. This defect is serious because a large amount of buttermilk in butter is closely related to poor keeping quality.

Butter is *leaky* when large water droplets appear on the back of the trier (fig. 8), on the end of the plug, or on the plug as a result of pressing with the thumb or with a hardwood paddle.

A small amount of water in the form of small beads is not objectionable and should not be criticized. Opinions on leaky butter, however, vary greatly in different sections of the country; some markets will take

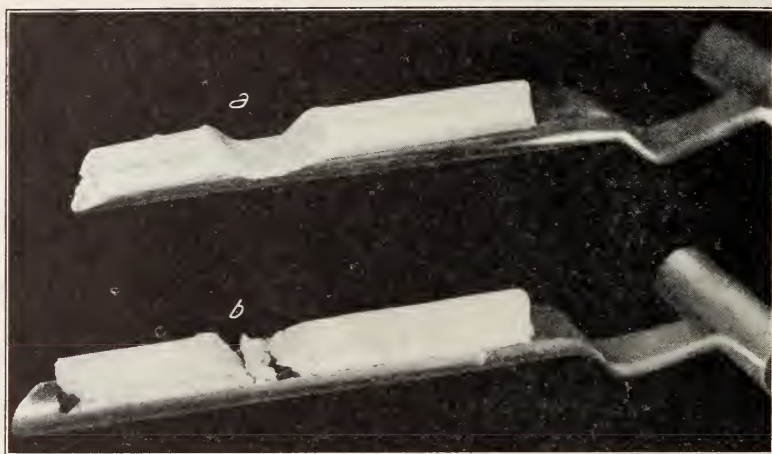


Fig. 9.—Two triers of butter: *a*, good texture; *b*, short-grained texture.

moist butter, while others prefer dry. Leaky butter is undesirable because it is liable to lose weight from evaporation of water. Crystallized salt particles often appear on the surface, a condition which the consumer does not like. The cause is improper methods used in washing and working.

Mealiness in butter refers to the grainy, powdery, sawdust-like condition, easily noticeable when tasting. Such butter is very objectionable, since it lacks palatability. Mealy butter is usually caused by a crystallization of milk fat, after there has been some “oiling-off” during the process of pasteurization. Extremely mealy butter may be easily prepared by melting a portion and resolidifying it. Mealiness may also result from casein particles in butter, which are usually caused by improper neutralization of sour cream.

Overworked butter, also known as “salvy,” usually has a dull appearance because the character of the grain has been destroyed. It usually results from working the butter too long in the churn, especially after all the water has been incorporated. If butter is overworked, a film of it will adhere to the back of the trier. It will not pull out cleanly, as does properly worked butter.

Short-grained butter, sometimes called "brittle" or "crumbly," has a tendency to spring apart when the thumb or hardwood paddle is pressed against the plug (fig. 9*b*). This defect is caused by large amounts of high-melting-point fats in the butter, and is especially common in the winter, when dry feeds are consumed by the cows. Butter that has been in cold storage at low temperatures is often short-grained, but a similar impression may be gained by judging the butter when it is too cold.

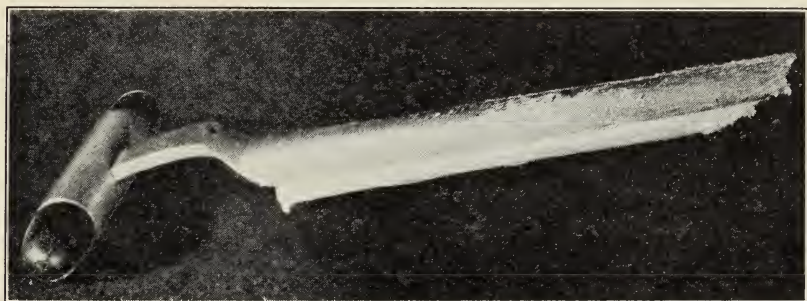


Fig. 10.—Sticky butter adhering to the back of the trier.

Sticky butter is common during the winter months, especially in districts where alfalfa hay is fed. When a plug is drawn, the butter sticks to the back of the trier, often rolling up (fig. 10). Difficulty is encountered in slicing such butter, especially with a cold knife. Stickiness is caused by an improper balance of milk fats.

Weak butter is lacking in firmness, and a trier may be inserted with little resistance. This condition is usually caused by churning at too high temperatures, which renders the fat soft, especially when the cattle are feeding on green grass during the spring of the year. This butter is objectionable because it does not stand up well at room temperature. It becomes soft and melts more readily than butter of firm body.

Color Defects.—*Color specks* in butter are uncommon. When present, they are usually yellow, and are caused by the addition of butter color which contains precipitated particles.

Mottled butter, also known as "wavy" butter, is streaked and uneven in color (fig. 11). A distinction is made between mottles and waviness by the representatives of the Bureau of Agricultural Economics in their butter-scoring procedure.¹² They designate a slight uneven color as wavy and may cut a minimum of 0.5 point. If the butter is so uneven as to be called mottled, it is not scored higher than 88 points, regardless of

¹² Brand, C. T. The inspection of butter under the food products inspection law. U. S. Dept. Agr. Service and Regulatory Announcement 51:1-23. 1919.

the flavor. This procedure accounts for the wide range for color of from 8 to 15 points (see Appendix). In student judging, however, the term "mottled" only is used, since at times difficulty is encountered in determining whether a sample is wavy or mottled.

Mottles are usually the result of uneven distribution of water in salted butter, causing a difference in reflection of light from the various droplets. This is especially true where the butter has been allowed to remain gritty, for salt particles draw water to them until they become dissolved.

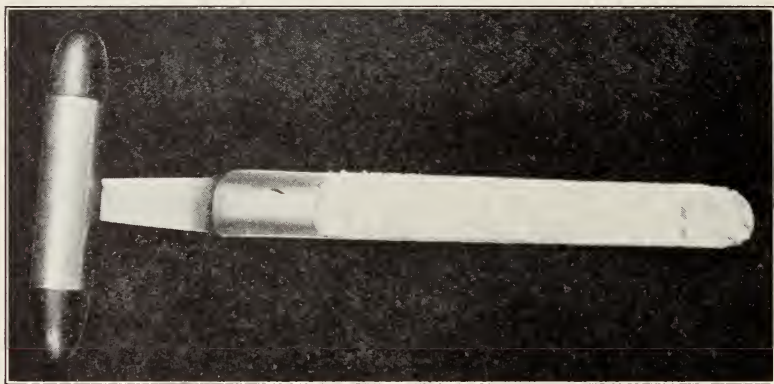


Fig. 11.—Mottled butter

Certain forms of mottles may also result from the addition of scrap butter to the churn, or from the lodging of part of the butter in the churn behind the baffle boards, where it cannot be properly worked and salted.

White specks in butter are caused by precipitated casein and may occur when high-acid starter is used or when overripe cream is churned. This defect is not common in the Pacific Coast area.

Salt in Butter.—*Grittiness* is the only defect listed under this subdivision of the score card, as high or low salt content may be criticized under flavors. Grittiness results from the presence of undissolved salt and may be detected by washing the butter between the teeth. It is caused by improper working of the butter. Undissolved salt in butter will, however, go into solution upon standing and may not be detected after a few days.

Package.—Five points are allowed for package; the normal range for scores in show contests is 4 to 5 points. As a tub may become soiled and the parchment disarranged in student contests, a perfect score is usually given.

Dirty tub refers to the box or tub and not to specks in the butter.

Untidy package may refer to the tub, which may have rough edges, split sides, or rusty nails, or to the parchment, which may be dirty, torn, or poorly arranged. Tubs which are not full or which are not scraped smoothly on top may also be criticized under this defect.

CHEESE JUDGING

Although there are many varieties of cheese in the world, only one, cheddar cheese, is scored in student judging contests. Colored cheddar is usually specified.

The procedure is similar to that used for butter. Finish should be scored first, before the surfaces are disfigured by continuous plugging. Flavor on cheese is scored about 1 point higher than is flavor on butter, the normal range of score being 30 to 41 points. Criticisms are checked with any score below 38.5 points on cheese, as compared with 37.5 points on butter. The winning samples of cheddar cheese in shows and fairs on the Pacific Coast during 1931 received from 95.5 to 97.5 points in total score. Such cheese should have the U. S. Extra Fancy requirements.¹³ The score card for cheddar cheese is given below.

CHEESE SCORE CARD *

Contestant No. Sample No.

	Student	Official	Grade		Criticisms		
			Score	Criticism			
Flavor (45).....					Bitter	FLAVOR Foreign	Whey taint
Body and texture (30).....					Cooked	Fruity	Unclean
					Feed	High acid	Yeasty
					Flat	Moldy	
Finish (15).....					BODY AND TEXTURE		
Color (10).....					Corky	Open	Too dry
					Gassy	Pasty	Weak
Total (100).....					Mealy		
Placing.....					FINISH		
					Cracked rind	Defective shape	Unclean surfaces
					Defective bandage	Moldy	Uneven edges
					Defective paraffin		
Grade on criticism.....					COLOR		
Total grade.....					Acid cut	Mottled	White lines
							White specks

* Recommended by the Western Division of the American Dairy Science Association, for student judging contests.

¹³ Fryhofer, C. S., and R. C. Potts. Handbook for use in the inspection of whole milk American cheese under the food products inspection law. U. S. Dept. Agr. Cir. 157:1-16. 1923.

Flavors in Cheese.—Defects in flavor of cheese, as in butter, are difficult to describe and may best be determined by comparing samples of varying quality.

Bitter cheese is very common, varying from a slight to a very pronounced degree. It usually results from the presence of certain types of bacteria and yeasts in the milk and cheese, or from the use of undesirable starter in the making process. In cheese made from raw milk, bitterness, if present, usually becomes more pronounced as the cheese ages.

Cooked flavor results from the use of pasteurized or heated milk for the manufacture of cheese. It resembles, to a slight extent, the flavor of overheated milk, and lacks the characteristic cheddar flavor. A slight bitter flavor often develops in such cheese at one to three months, but usually becomes less pronounced as the cheese continues to age. Cooked flavor is not common in scoring contests, since very few exhibits are made from heated milk.

Feed flavor may be present in cheese when the cows consume such feeds as onions, garlic, cabbage, turnips, leek, and silage. The effect of alfalfa and clover is not well known, but they are probably a less desirable feed than mixed grasses for the production of characteristic cheddar flavor. Slight feed flavors in cured cheese are usually covered up by the development of the normal cheddar cheese flavor.

Flat is a term used in criticizing cheese which, although clean, is lacking in characteristic cheddar flavor. Such cheese is usually uncured and of low acid content.

Foreign flavor is seldom designated in cheese judging. It may be used, however, when a defect in flavor is present, and cannot be identified as any other flavor listed. Cheddar cheese is not liable to absorb foreign flavors as butter does.

Fruity flavors are sweet and somewhat sickening. They usually resemble the flavor of ripe pineapples, strawberries, or raspberries. This defect is caused by bacterial contamination of the milk resulting from the lack of cleaning and sterilization of utensils and equipment, especially milk cans in which whey has been hauled from the factory to the farms. Exposing milk to foul odors, using poor starter, or soaking the curd in water, which results in excessive moisture content, may also cause the difficulty.

High-acid cheese has a clean, sharp, acid flavor, caused by the excessive development of acidity in the milk before making, or in the cheese during manufacture or curing. This defect is common in cheese of high moisture content, since excessive amounts of milk sugar have been allowed to remain and have been changed to lactic acid. High-acid cheese is often bleached in color, and weak, mealy, or crumbly in texture.

Moldy flavor in cheese is not common in scoring contests. Judges usually do not designate this defect unless the mold is rather evenly distributed throughout the cheese. If a student draws a moldy plug, he would do well to draw several more from different locations before making a decision regarding the defect. Mold often grows on the surface of cheese and may gain entrance into the interior, especially in the case of mechanical holes, since molds need air for growth. Cheddar curd may become contaminated in the making process by the air in poorly ventilated factories, or by the use of moldy equipment. Extreme precautions should be taken in sterilizing and drying the small whisk brooms used in brushing the curd in the vats.

Whey taint is a defect which is apparently not recognized nationally, but the term is used locally, especially in the western states. Such cheese is sour but mild, having more of a starter flavor than the sharpness of high-acid cheese. The use of tainted starter and the presence of excess moisture in the cheese are factors in causing this defect, which is especially noticeable in uncured cheese.

Unclean flavor is a very common defect in cheese scoring. Although the term is probably detrimental to the cheese industry, there seems to be no other criticism which may be substituted. Cheese with this defect leaves an unpleasant aftertaste, and is somewhat sickening, although it does not possess the sweetness of fruity cheese. Several off-flavors may be said to be unclean, and are caused by detrimental bacterial and chemical action during the curing process.

Yeasty cheese has a flavor closely resembling that of yeast. It is usually associated with small pinholes appearing in the green, freshly made cheese. These holes eventually become larger, and often form fish-eye slits. This defect is caused by the presence of yeast organisms in the milk or in the starter. It usually occurs in cheese having a high moisture content.

Body and Texture.—Body and texture of cheese are given 30 points on the score card. Cheese with good body and texture should be comparatively firm, free from mechanical or gas holes, and should work up into a smooth, waxy mass between the fingers and thumb.

Almost no maker can produce cheddar cheese without the presence of some mechanical holes. Such cheese is scored 29 to 30 points for body and texture without criticism. Cheese with distinct defects in body and texture is scored 25 to 28.5 points. A description of defects in body and texture should aid in their identification.

Corky texture, sometimes called "rubbery," is often found in unripened cheese. Between the teeth, it gives a sensation similar to the biting of cork or rubber, although not to so extreme an extent. It is

usually caused by the use of too much rennet extract in coagulating the milk, or by firming the curd at a high temperature.

Gassy body is usually associated with unclean or bitter flavors. Gas holes may be either large or small, but are usually regular in shape and shiny in appearance (fig. 12). The formation of gas in cheese is caused by the presence and activity of gas-forming bacteria in the milk. Efficient sterilization of utensils in the dairy, care in production of the milk,



Fig. 12.—Defects in body and color of cheese; the round holes are caused by gas; white specks are very pronounced.

and proper cooling should prevent the contamination and growth of these organisms. The use of an active starter will help to overcome gas formation in the cheese-making process.

Mealy texture is the grainy condition noticeable in the mouth as the defective cheese becomes softened. It is usually associated with a high-acid flavor and a bleached or faded color. The excessive development of acidity causes these defects. A slight mealiness is also often associated with a brittle or crumbly body in cheese which has been cured for several months.

Openness is the most common of all the defects in body and texture. The term "mechanical holes" is often used instead of "open." Such openings are irregular in shape and vary in size and location throughout the cheese. A cheese sufficiently open to be subject to deductions is shown in figure 13. In scoring cheese for openness, plugs should be drawn from three or four different places, and an average score given.



Fig. 13.—Open cheese has mechanical holes irregular in shape. Note that it is possible to draw a perfect plug from this cheese.

Three triers of cheese with varying degrees of openness are shown in figure 14. Openness is caused by lack of sufficient pressing, low acid development in the cheese, and high curing-room temperature.

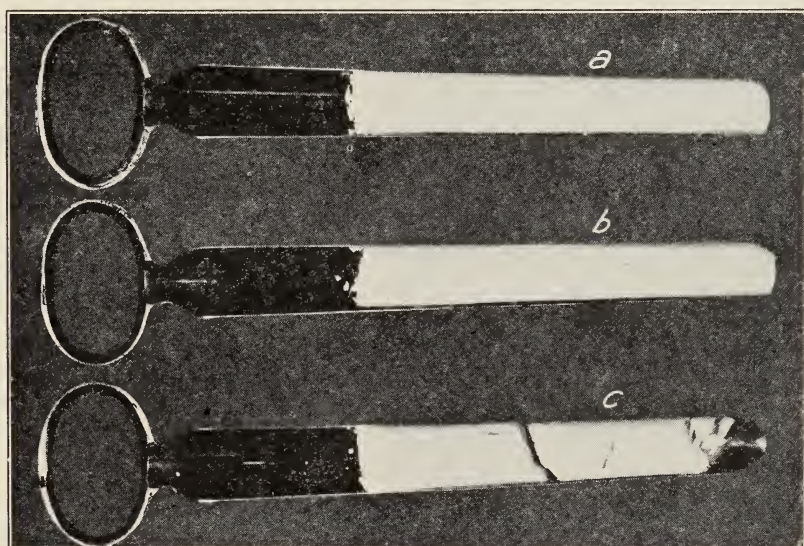


Fig. 14.—Body and texture: *a*, perfect plug, scoring 30.0 points; *b*, slightly open, scoring 29.5 points; *c*, open, scoring 28.5 points.

Pasty cheese, when worked between the fingers and thumb, resembles a mass of soft, thick paste. It usually results from the incorporation of excessive amounts of moisture in the curd. The back of the trier is often greasy when a plug of pasty cheese is drawn.

A cheese which is *too dry* is easily detected. The plug does not have the usual "bend" of good cheese, and cannot be worked into a waxy mass with the fingers and thumb. Low moisture content, caused by excessive firming of the curd during heating or by drying out in the curing room, accounts for this defect.

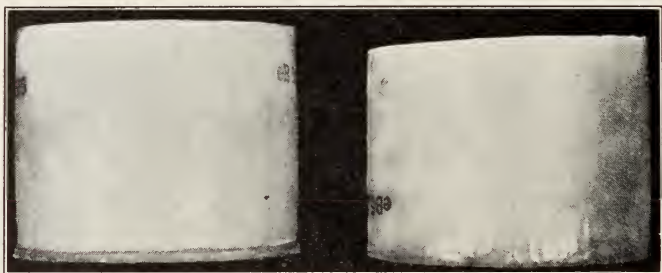


Fig. 15.—Finish of cheese: left, desirable shape; right, defective shape, showing uneven height of edges.

Weak cheese is usually crumbly and does not slice properly. A plug will not bend, but breaks into pieces with very little resistance. The cause may be inefficient pressing or high acid development during curing. Cheese made from heated milk is often weak in texture.

Defects in Finish.—The finish or exterior appearance of cheese is important in marketing and reflects upon the ability of the maker. A perfect score is 15 points.

Cracked rinds are openings, cracks, or crevices in the surfaces or rind of the cheese. This defect is very detrimental because it allows loss of moisture and milk fat, permits the growth of mold, and gives an accessible path for entrance of cheese pests. Rapid drying-out of the cheese is the chief cause of the cracks.

Defective bandage may refer to lack of bandage, too much bandage, wrinkled bandage, or the absence of end caps. Any condition of the bandage which detracts from the good appearance of cheese should be criticized. Some authorities do not deduct points when end caps are not used. One should do so in educational scoring, however, since their presence aids in preventing cracked rinds and the growth of mold.

Defective paraffin is apparent when the coating is too thick, or when it has worn off entirely from handling in the curing room or in transit.

A thick coating is caused by paraffining at too low a temperature or by paraffining a second time without allowing the initial coating to melt. Thick paraffin will scale off when a plug of cheese is drawn.

Defective shape refers to any abnormal shape of cheese. A perfectly shaped cheese should be uniformly cylindrical, and of even height throughout. A very common defect is uneven height of the two sides (fig. 15), usually caused by a buckling of the hoops in the press.

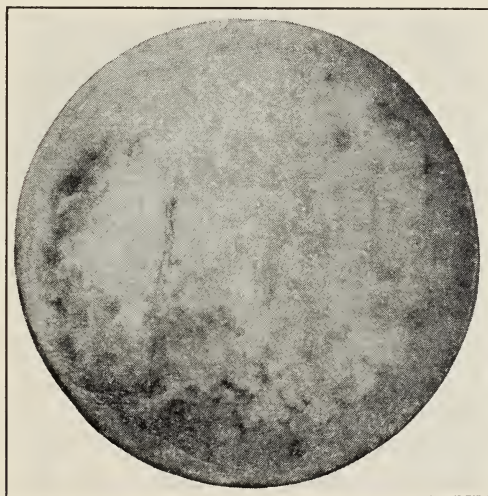


Fig. 16.—Dark-colored areas indicate presence of blue mold.

Moldy surfaces are common on cheddar cheese. The mold is usually bluish in color (fig. 16), but grayish or blackish mold sometimes grows. Mold growth occurs in contaminated curing rooms, especially when the moisture content of the air is high and when the cheese is given improper care.

Unclean surfaces is a term indicating the presence of dirt, rust, stamping ink, or other foreign material on the cheese or sometimes on the bandage underneath the paraffin. It should not be confused with mold. In case of doubt, a student should observe the odor: mold has a distinct odor, whereas unclean surfaces usually do not.

Uneven edges result from using, in the cheese hoops, followers which do not fit properly. A portion of the cheese, squeezed out through the opening causes the defect (fig. 17).

Color of Cheese.—Most cheddar cheese made on the Pacific Coast is yellow, since a small amount of cheese color is added to the milk. Uncolored cheddar cheese is sent from Wisconsin, however, to scoring con-

tests throughout the country. The presence or absence of cheese color has no effect on flavor, body, or texture. White cheddar, as well as colored, is given a perfect score of 10 points provided the color is even.

Acid-cut cheese is that which is bleached or faded throughout, or which has white areas around the openings only. Faded color results from high acid development during the manufacture or curing and is associated with such a flavor, as well as with mealy or weak body and



Fig. 17.—An uneven edge is clearly shown on this cheese.

texture. White blotches around the openings are caused by the accumulation of whey or moisture in the pockets. The milk sugar in this whey is changed to lactic acid, which causes the bleaching.

Mottled cheese is uneven in color, like wavy butter, because of uneven distribution of water throughout the cheese. Mottling is usually a defect of uncured cheese only, since the water has a tendency to become evenly distributed as the cheese ages.

White lines, though very common in all cheddar cheese, are more noticeable in the colored type. Some authorities, therefore, believe that colored and uncolored types should not be scored in the same class. The lines usually appear throughout an entire cheese having the defect (fig. 18), and the outline of the curd particles is often apparent. The lines are mostly milk fat, which has accumulated on the surface of the curd particles because of improper methods used in making the cheese.

White specks often occur in aged cheese (fig. 12) and according to Van Slyke and Price,¹⁴ "are believed to be a calcium soap, formed by the combination of calcium with some fatty acid derived from fat by the action of some microorganism acting only at low temperatures." They

¹⁴ Van Slyke, L. L., and W. V. Price. Cheese. 364 p. Orange Judd Publishing Company, New York. 1927.

vary in size in different cheeses, and are not considered to be injurious to health. Some authorities do not deduct from the score for specks, believing them to be a normal constituent under certain conditions. In some cases they may result from precipitated casein in starter, when the starter has been added after the color.

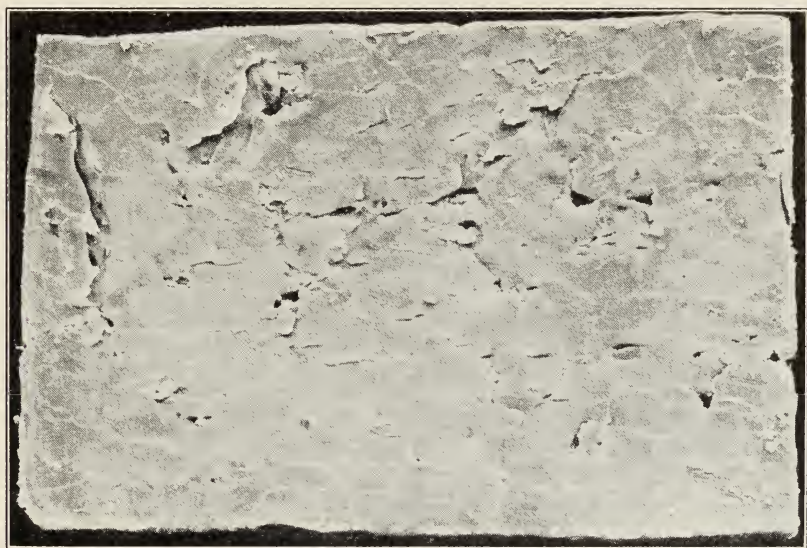


Fig. 18.—White lines are commonly found in cheddar cheese.

ICE CREAM JUDGING¹⁵

Leading authorities do not agree on a score card for ice cream, neither in the number of points under each subdivision, nor in the proper criticisms to be used. The Rules Committee of the Western Division of the American Dairy Science Association has adopted the scale of points on the accompanying score card and, in general, the criticisms suggested by Turnbow and Raffetto.¹⁶ This score card allows 50 points for flavor, 25 points for body and texture, and 5 points for package and color—a total of 80 points. The remaining 20 points on show score cards are allotted to bacterial count, which is not considered in student judging.

Vanilla ice cream is judged by students. Considerable practice is necessary because the use of sugar in the mix, and the coldness of the ice cream are two factors not encountered in the judging of the other dairy products.

¹⁵ Acknowledgment is made of the suggestions of W. C. Cole in preparing the material on ice cream.

¹⁶ Turnbow, G. D., and L. A. Raffetto. *Ice cream*. 407 p. John Wiley and Sons, New York, 1928.

Flavors in Ice Cream.—The flavor of vanilla ice cream should be clean and sweet, with sufficient extract present to impart a characteristic vanilla flavor. Ice cream from different plants, however, will vary from a delicate to a high flavor. The normal score for flavor is 35 to 45 points, and a criticism is checked if the score is 44 points or less. Defects in flavor are described by Turnbow and Raffetto¹⁷ and by Sommer.¹⁸ They are easy to detect when a comparison of different samples is made.

ICE-CREAM SCORE CARD *

Contestant No. Sample No.

	Student	Official	Grade		Criticism
			Score	Criticism	
Flavor (50).....					FLAVOR Bitter High acid Poor vanilla Condensed Lacks flavor Salty milk products Lacks sweetness Stale Egg Metallic Too sweet Foreign Neutralizer Unnatural High flavor Old cream flavor
Body and texture (25).....					
Package and color (5).....					
Total (80).....					
Placing					BODY AND TEXTURE Buttery Icy Sticky Coarse Sandy Weak Soggy
Grade on criticism.....					
Total grade.....					PACKAGE AND COLOR Dented Rusty Uneven color No parchment Untidy Unnatural color Not full Too high color

* Recommended by the Western Division of the American Dairy Science Association, for student judging contests.

Bitter flavor in ice cream is uncommon. It may be caused by the use of bitter milk or cream, or by bacterial action in a mix which is held for a long time before freezing. Calcium chloride brine that has leaked from the coolers into the mix, may in some instances account for bitter flavor.

Condensed milk products are normal constituents of factory-made ice cream. They increase the food value and aid in obtaining smoothness. Skim-milk powder, plain condensed skim milk, and sweetened condensed skim milk are the products generally used. Their presence in excessive quantities under various conditions results in the above criticism. The prominence of these products may be partially counteracted by using

¹⁷ Turnbow, G. D., and L. A. Raffetto. Ice cream. 407 p. John Wiley and Sons, New York. 1928.

¹⁸ Sommer, H. H. The theory and practice of ice cream making. 628 p. Published by the author, Madison, Wisconsin. 1932.

increased amounts of vanilla extract. If excessive amounts are used, high flavor may result.

Egg flavor is normal in French vanilla ice cream, but authorities disagree as to the value of its presence in plain vanilla. It is common, however, since the tendency at the present time seems to be towards the use of egg yolks, fresh, frozen, or powdered, in plain vanilla ice cream mix. Some judges criticize egg flavor severely, while others score the ice cream high if the egg is well incorporated. Yolks or powder of inferior quality are very detrimental. When fresh yolks are added, pasteurization of them in all or a part of the mix is desirable to prevent a raw egg yolk flavor.

Foreign flavors are any flavors which are foreign to ice cream, such as disinfectant, gasoline, paint, and tar. Some of these have been discussed under flavor defects in milk. Care in the selection of the materials to be used in the construction and repair of hardening rooms is important in preventing foreign flavors.

High flavor in vanilla ice cream results from the use of too much vanilla extract of good quality. Personal preference varies somewhat, some judges being critical, others lenient, in scoring a sample with high flavor. Student judges should not be too critical.

High-acid flavor is caused by the development of excessive amounts of lactic acid in one or more products used, or by holding the mix at too high temperatures for long periods of time. A very high-acid sample may be termed sour and is not a marketable product.

Ice cream *lacks flavor* when an insufficient amount of vanilla extract is used. A delicate vanilla flavor is desired by many people, but sufficient extract should be used to enable the flavor to be detected.

Ice cream *lacks sweetness* when too little sugar is used. Sugar content varies in different samples; the average is about 15 per cent. A majority of judges would probably criticize ice cream as lacking in sweetness if it contained less than 12 to 13 per cent sugar.

Metallic flavors also known as "tallowy," "astringent," and "oxidized," are sometimes found in ice cream. They are caused by the use of dairy products which have such defects, or by contact of the ice cream mix with injurious metals. Prolonged storage of the mix or of the ice cream intensifies this defect. Skim-milk products, used to increase the solids in ice-cream mix, are often metallic in flavor when processed in iron or copper equipment, especially that which is not clean and sterile.

Neutralizer flavor is liable to be present if dairy products of high-acid content have been used in the mix and alkalies have been added to reduce the acidity. The California Dairy Laws forbid the use of neutralizers in

case the acidity of the milk or cream used in processing a mix exceeds 0.20 per cent acid.

Old-cream and old-butter flavors are caused by the use of inferior products as a source of milk fat. They are sometimes difficult to identify, unless rancidity is present. Sugar and vanilla extract have a tendency to cover up slight old-cream defects.

Poor vanilla in ice cream is very common, because of the use of flavors containing synthetic vanillin, coumarin, heliotropine, tonka extract, or other substances. These often give an undesirable flavor, making the ice cream much less palatable than when pure vanilla extract is used. The presence of excessive amounts of these flavors is not criticized as high flavor in student judging.

Salty flavor in ice cream, though not common, is sometimes caused by the presence of sodium chloride (table salt) in the sample. A small percentage of salt is used in the mix by some manufacturers, but this addition is liable to injure the flavor rather than improve it. Brine from the ice and salt used in packing ice cream sometimes leaks into the container and causes salty flavor. In this case, with hardened ice cream, the defect is only present on the outside portions.

Stale flavor is very common in ice cream when stale ingredients have been used or when it has been held too long after being manufactured. It is a lack of freshness and is common during the winter months, when the turnover is less rapid than during the summer.

Ice cream is *too sweet* when excessive amounts of sucrose are used in the mix. Sugar increases the total solids of ice cream, and, being a comparatively low-priced ingredient, is often used in excess. A portion of the sucrose is sometimes replaced with corn sugar, which is about 60 per cent as sweet. This increases the solids without increasing the sweetness to such a great extent.

Unnatural flavor results from the use of flavoring extracts other than vanilla; almond, maple, and marshmallow, for instance, are sometimes found in samples that are to be judged as vanilla ice cream. This defect may result from the use of other ingredients which are foreign to vanilla extract.

Body and Texture.—The normal range of score for body and texture is 20 to 25 points. Excellent or nearly perfect samples are scored 24 to 25 points and are not criticized. The usual range with criticism is 20 to 23.5 points. Although melting quality is considered by some authorities to be important, the present score card makes no provision for this item.

When body and texture are scored, all samples should be at the same temperature. Soft ice cream should not be compared with hard.

Buttery ice cream is that which contains butter granules large enough to be detected. They are usually present when the mix has not been homogenized, or when it has been improperly homogenized. Efficient homogenization should prevent this defect, since the fat globules are divided so finely as to make coalescing of them impossible during the freezing process. A greasy condition, often apparent in ice cream of high milk fat and low solids-not-fat content, is also considered by some authorities to be buttery.

Coarse texture, one of the most common defects of ice cream, results from the formation of ice crystals¹⁹ during the hardening process, their size affecting the coarseness or smoothness of the product. The presence of the crystals is easily detected by crushing the frozen ice cream between the teeth or between the tongue and the roof of the mouth. Correct composition of the mix, low drawing temperature of the partially frozen product, and quick hardening are important in producing smooth ice cream.

Icy texture results from the formation of very large ice crystals, which melt quickly in the mouth. Apparently no distinct line can be drawn between coarseness and iciness, the degree of the defect determining which criticism shall be checked. Alternate softening and hardening of coarse ice cream will soon cause ice crystals to increase in size. Particles of ice are often found in comparatively smooth ice cream served at soda fountain counters. Water droplets, falling into the containers from dippers which have been submerged in water, become frozen and cause this difficulty. Such ice cream should not be considered icy by student judges.

Sandy texture refers to a grittiness or roughness caused by the formation of crystals of lactose (milk sugar), which melt in the mouth more slowly than ice does. These crystals are caused by the presence of excessive milk solids-not-fat in the ice cream. Lactose has a low solubility in water; if too much is added, crystallization will take place in a few days after freezing, the time depending upon the temperature of hardening and storing.

Soggy ice cream is heavy because a sufficient amount of air is not incorporated during the freezing process. The weight per gallon is high in relation to the total-solids content. Ice cream with this defect is dipped with difficulty and is not so palatable and refreshing as that with the proper air content.

Sticky ice cream is gummy and adheres to the dipper or spoon. Even though it contains the proper amount of air, it somewhat resembles that

¹⁹ Cole, W. C. A microscopic study of ice cream texture. Jour. Dairy Science, 15, No. 6. 1932.

which is soggy. This defect results from the excessive use of stabilizer or sugar, which often decreases the tendency for ice cream to melt normally. Sticky samples, having jelly-like consistency upon becoming soft, are very resistant to melting at room temperature.

Weak ice cream is somewhat nonresistant to heat. It may be dipped without much effort, and it melts quickly in the mouth. This defect is caused by insufficient stabilizer or excessive incorporation of air, especially with low solids mix. Ice cream with high overrun, although judged as weak in western collegiate contests, is often criticized elsewhere as fluffy.

Package and Color.—These items are listed under one subdivision on the student judging card, a total of 5 points being given for samples without defects. The normal range of score is 3 to 5 points, and the usual procedure is to deduct 0.5 or 1 point for a defect, according to its degree of prominence. In some contests, the containers are not observed, only defects in color being considered.

Dented containers are unattractive, and are the result of rough handling. Although volume is not appreciably affected in dented cans, objections are often voiced by dealers.

No parchment is checked on the score card when the manufacturer fails to cover the containers of ice cream with parchment paper before putting on the lids. Parchment prevents contact of the ice cream and lid, protects against brine leaks, and makes the package appear attractive.

Packages which are *not full* are sometimes exhibited. Although they were completely filled at the time of manufacture, a shrinkage of as much as $\frac{1}{2}$ inch may have occurred. These samples have usually been shipped a considerable distance, and have been handled roughly. Low solids mix, high overrun, lack of sufficient stabilizer, and the use of enzymes in the mix are factors concerned with production which aid in causing this defect.

Rusty package is applicable only to metal containers. Criticism is made when the interior of the container shows rust spots. Metal containers readily show rust spots on the outside due to frequent contact with brine. Criticism of rust on the outside of containers is made only when the rust causes the container to appear unsightly.

Untidy package is one which is not neatly prepared. Poorly arranged parchment, rusty containers, or other defects may be included under this criticism.

Too high color in ice cream results from the use of too much yellow coloring solution. Vegetable coloring (annatto) used in excess gives a

high yellowness, while chemical or coal-tar food coloring gives a lemon-yellow tinge. The latter color may be called unnatural by some judges. A creamy color is considered to be ideal, and any yellow shade above it is criticized.

Uneven color is not common but may be found when color is added to the batch in the freezer late in the freezing process. In this case, varying shades of yellow may appear.

Unnatural color refers to any shade unlike the desirable creamy yellow color. The ones most commonly found are orange, brownish, and pinkish. Excessive lemon-yellow shades are considered as unnatural by some judges.

APPENDIX

RULES FOR COLLEGE STUDENTS' CONTEST IN JUDGING DAIRY PRODUCTS, PACIFIC INTERNATIONAL LIVESTOCK EXPOSITION, PORTLAND, OREGON, REVISED FOR 1932

1. Any agricultural college may enter one team of three members, each member being an undergraduate student, who is regularly matriculated in a four years' collegiate course, who has taken no less than one year's work in the institution he represents in the contest, or one year's work in a junior college, and who has never acted as instructor of dairy products courses or as official judge of dairy products at a fair or show, or taken part in a dairy-products judging contest of interstate or national character. Only members of teams may compete.

2. Notice of the coach's intention to enter a team must be received by the superintendent not later than one week before the contest.

3. The contestant will be given 7 samples of milk, 7 of butter, 7 of cheese (colored cheddar), and 7 of vanilla ice cream to score, criticize, and place. Two key samples of each product on which the judges' scores and criticisms are displayed will be placed before the contestants 15 minutes before and during the contest as a guide. The key samples shall be representative of good and poor products.

4. Contestants shall furnish their own triers.

5. Three-fourths of an hour in addition to the 15 minutes allowed for examining the key samples will be allowed for scoring each product. Products will be scored in the following order: (1) milk, (2) butter, (3) cheese, (4) ice cream. Students shall not be allowed to inspect samples of the next product to be judged until the time set and announced by the superintendent.

6. There shall be no communication between contestants or between a contestant and anyone else except as allowed by the superintendent, and then only in the presence of the superintendent or his representative.

7. Any contestant violating a rule of the contest or attempting to take unfair advantage will be barred from the contest; thus, his team is barred from the contest, although the remaining members may compete for the individual prizes.

8. In case of a tie between individuals or teams, the award shall be given to the party losing the lowest number of points in (1) comparison with official scores, (2) criticism, (3) and placing of samples.

Superintendent

It shall be the duty of the superintendent of the contest to see that all rules and regulations governing the contest are duly carried out and to see that the contest is conducted with fairness and justice to all concerned. He may make additional rules, shall decide all questions which may arise in connection with the contest, and his authority in all matters pertaining thereto shall be final.

Judges

Three judges selected by the superintendent shall score each product. They shall decide by agreement what score and criticism is to be given each sample. They shall make no criticism to which all cannot definitely agree and shall make no more criticisms than are absolutely needed to explain their scores. Judges shall confine their criticisms to those on the score card. They shall decide on a score for each division of the score card before deciding on the total score to be given to the sample. In other words, they are not to decide on a definite total score for a sample and then make their cuts to agree with the score. The judges must keep in mind that the students are graded on their ability to score each division of the score card.

Products

Products required for the students' dairy-products judging contest shall be furnished by the Pacific International Livestock Exposition.

Butter, Cheese, and Ice Cream

The samples of butter and cheese shall be arranged so that all the students may work at the same time on one product. If possible, the butter, cheese, and ice cream used in the contest shall be selected from regular entries in the Western Dairy Products Show. In selecting these

products, as well as the milk, the superintendent of the contest shall select samples which have not been given the same scores, or extremely close scores, by the official judges of the show.

Milk

Samples of milk of at least one quart shall be provided for the students to score on flavor and odor. The milk shall be warmed, and the superintendent or his assistant shall pour samples of it in individual containers for students to taste and shall allow each one to smell the portion remaining in the large container. Care shall be taken to see that the temperature of the milk is at least 90 degrees and not more than 100 degrees Fahrenheit. The official judges shall score each sample of milk on flavor and odor immediately before submitting it to the students.

Grading and Rating of Students

The work of the contestants shall be graded on comparison of scores, criticisms, and placings of the samples with those of the official judges. The deductions on scores, criticisms, and placings shall be graded separately, but grades shall be added together for the total for each product. The rating for the students and teams shall be expressed negatively; or, in other words, the student or team with the lowest grade shall be declared winner. The rating shall be established by grading committees consisting of the superintendent of the contest and such assistants as he may select. The grader should use a pencil of a different color from the one used by the student.

Determination of Final Rating on Scoring

In rating the students in all three products on comparison of scores with those of the official judges, each contestant shall be debited with the difference between his score and the official judges' on each division of the score card. For instance, 45 points are allowed for flavor of butter; then, if the official judges score a particular sample 40 and the contestant scores it 37, the contestant's rating on scoring flavor would be 3. The student shall not be rated on comparison of his total scores with those of the official judges, except in the placing of samples.

On Criticism

Criticism rating on each product shall be based on all seven samples. For each mistake in criticism, the student shall be debited 2 points. If no criticism is made by the student and one is made by the official judges, the student shall be debited 2 points. For instance, if the official judges

criticize the flavor of a sample "fishy," and a student makes no criticism, his rating on flavor shall be 2. If the official judges criticize the flavor of a sample as "fishy" and the student marks down "moldy" instead of "fishy," his rating on flavor shall be 2. The total deductions on criticisms shall be divided by two before being added to the total rating on the product.

On Placing

The rating for placing of samples shall be determined by the difference between the position of the contestant's sample and the official judges'. Total scores will be taken into consideration; for instance, if the contestant places the highest scoring sample fourth, he is debited 3 points; if he places the second highest sample seventh, he is debited 5 points; and so on for all seven samples. The sum of the differences shall be the student's rating on placing. The student shall have no ties in the placings.

Final Placing

The final standing of each individual and team shall be determined for each product and for all products by adding the rating on scoring, criticism, and placing.

Score Card

The following score cards with possible criticisms shall be used by the official judges and students in scoring the products in the 1932 contest.

BUTTER SCORE CARD

<i>Flavor</i> : Score 45-38.....			No criticism
Score 37.5 or less.....	Bitter Briny Cheesy Coarse Feed Fishy	Flat Foreign High acid Metallic Neutralizer	Oily Old cream Rancid Scored Tallowy Unclean
<i>Body and Texture</i> : Score 25.....			No criticism
Score 24.5 or less.....	Cloudy brine Leaky Mealy	Overworked Short-grained	Sticky Weak
<i>Color</i> : Score 15.....			No criticism
Score 14.5 or less.....			Color specks Mottled White specks
<i>Salt</i> : Score 10.....			No criticism
Score 9.5 or less.....			Gritty
<i>Package</i> : Score 5.....			No criticism
Score 4.5 or less.....			Dirty tub Untidy

Instructions.—Student scores each item and places check mark to right of defect. Smallest cut on any item 0.5 point, except 0.25 point may be used to break ties.

Notes:

Normal score on flavor.....	30-40
Normal score on body.....	23-25
Normal score on color.....	8-15
Normal score on salt.....	9-10
Normal score on package.....	4- 5

As the tub may become soiled and the parchment disarranged by the student, "package" shall be given a perfect score in this contest.

CHEESE SCORE CARD

<i>Flavor</i> : Score 45-39.....				No criticism
Score 38.5 or less.....	Bitter Cooked Feed Flat	Foreign Fruity High acid	Moldy Whey taint Unclean Yeasty	
<i>Body and Texture</i> : Score 30-29.....				No criticism
Score 28.5 or less.....	Corky Gassy	Mealy Open	Pasty Too dry Weak	
<i>Finish</i> : Score 15.....				No criticism
Score 14.5 or less.....		Cracked rind Defective bandage Defective paraffin Defective shape	Moldy Unclean surfaces Uneven edges	
<i>Color</i> : Score 10.....				No criticism
Score 9.5 or less.....			Acid cut Mottled White lines White specks	

Instructions.—Student scores each item and places check mark to right of defect. Smallest cut on any item is 0.5 point, except 0.25 point may be used to break ties.

Notes:

Normal score on flavor.....	30-41
Normal score on body.....	25-30
Normal score on finish.....	13-15
Normal score on color.....	9-10

MILK SCORE CARD

<i>Flavor</i> : Score 25-23.....				No criticism
Score less than 23.....	Barney Bitter Cooked Feed	Flat Foreign High acid Musty	Rancid Salty Tallowy Unclean	

Milk scoring within the normal range will be used in the contest.

Sediment.—Score sediment disks as per photograph in Department Circular 384, "Milk and Cream Contests," issued by the United States Department of Agriculture. Smallest cut given is 0.1 point. No criticisms required.

<i>Bottle and Cap</i> : Score 5.....				No criticism
Score less than 5.....	Chipped mouth Dirty bottle Leaky cap Lip not protected	Lip partially protected Not full Thumb capped		

Instructions.—Student shall score each item and place check mark to right of defect.

Notes:

Normal score on flavor.....	12-24
Normal score on sediment.....	0-10
Normal score on bottle and cap.....	3- 5

Suggested Cuts on Bottle and Cap:

Bottle not full.....	0.25 to 1.0
Dirty bottle.....	0.5 to 2.0
Leaky cap.....	0.1 to 0.5
Chipped mouth.....	0.1 to 0.5
Lip not protected.....	1.0
Lip partially protected.....	0.25 to 0.75
Thumb capped.....	0.5

ICE CREAM SCORE CARD

Flavor: Score 50-44.5.....No criticism

Score 44.0 or less.....	Bitter	Metallic
	Condensed milk	Neutralizer
	products	Old cream
	Egg	Poor vanilla
	Foreign	Salty
	High flavor	Stale
	High acid	Too sweet
	Lacks flavor	Unnatural flavor
	Lacks sweetness	

Body and Texture: Score 25-24.....No criticism

Score 23.5 or less.....	Buttery	Icy	Sticky
	Coarse	Sandy	Weak
		Soggy	

Package and Color: Score 5.....No criticism

Score 4.5 or less.....	Dented	Too high color
	No parchment	Uneven color
	Not full	Unnatural color
	Rusty	Untidy

Instructions.—Student scores each item and places check mark to right of defect. Smallest cut on any item is 0.5 per cent, except 0.25 point may be used to break ties.

Notes:

Normal score on flavor.....	35-45
Normal score on body and texture.....	20-25
Normal score on package and color.....	3- 5

As the package may become soiled and the parchment disarranged by the student, "package" shall be given a perfect score in the contest.